

**IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF PENNSYLVANIA**

CARPENTER TECHNOLOGY CORP.,	:	CIVIL ACTION
Plaintiff	:	
	:	
v.	:	NO. 08-2907
	:	
ALLEGHENY TECHNOLOGIES	:	
INC., et al.,	:	
	Defendants	

M E M O R A N D U M

Stengel, J.

August 2, 2011

The parties in this case, Carpenter Technologies, Inc. (“Carpenter”) and Allegheny Technologies Inc./ATI Properties (“ATI”), are business competitors in the manufacture and sale of specialty alloys. The defendant, ATI, is the owner of the ‘564 Patent, entitled “A Method for Producing Large Diameter Ingots of Nickel Base Alloys.” Carpenter has moved for summary judgment of invalidity of Claims 1-11, 13, 14, 16-18, 21, and 27-31 of the patent, on the ground that the patent as issued was obvious. For the reasons set forth below, I will deny the motion.

I. FACTUAL BACKGROUND

The specialty alloy ingots made by Carpenter and ATI are primarily used in the aerospace and energy industries. Pl.’s Statement of Material Fact in Supp. Of Motion for Summ. J. Based on 35 U.S.C. § 103(a) (“Carpenter SMF”) ¶ 1.¹ The specialty alloys relevant to this motion are Alloy 706 and Alloy 718, nickel base alloys. *Id.* at ¶ 2. The ingots made using these alloys are, among other things, constituent disk parts in gas fired turbines used for power generation. *Id.* at

¹ Where a statement of fact asserted by Carpenter is undisputed, it will be cited herein. Disputed issues of fact will be noted.

¶ 3. General Electric Power Systems Division (“GE”) is the only consumer for the large disk forgings made by Carpenter and ATI. Id. at ¶ 6; see Defendants’ Resp. to PL.’s Statement of Material Fact in Support of Motion for Summary Judgment Based on 35 U.S.C. § 103(a) (“ATI SMF”) ¶ 5.

The nickel base superalloy ingots required for use in gas fired turbines are made using special melting and casting techniques referred to generically as the “triple melt process.” Carpenter SMF ¶¶ 8, 16. This process is comprised of three main steps: the first step is Vacuum Induction Melting (“VIM”), during which molten alloy is cast into a mold and solidifies, providing an ingot also termed an “ESR electrode.” Id. at ¶ 9; see also ATI SMF” ¶ 9. The ESR electrode is used in the second step of the process, Electroslag Remelting (“ESR”), during which the electrode is remelted by the heat generated by the passage of electric current through a conductive slag. See id.; Parties’ Joint Claim Construction and Pre-Hearing Statement (“Joint Claim Construction”), ECF Doc. No. 44. “As the electrode is advanced into the slag and begins to melt, droplets of molten material form and pass through the heated slag, which removes oxide inclusion and other impurities.” Carpenter SMF at ¶ 9; Joint Claim Construction at 3, (“electroslag remelting the alloy”). After the ESR step is complete, the resultant ESR ingot is given further heat treatments to relieve stress in and homogenize the ingot. Carpenter SMF ¶ 10; ATI SMF ¶ 10. The third step of the triple melt process is Vacuum Arc Remelting (“VAR”), a metal refining process of progressively heating the VAR electrode (which is essentially the ESR ingot produced following the second step) in a water-cooled crucible under vacuum conditions using the heat generated by an electric arc “struck between the electrode tip and the surface of the ingot.” Carpenter SMF ¶ 11; ATI SMF ¶ 11. The result of the triple melt process is a VAR

ingot that may be cropped, grinded and inspected. Carpenter SMF at ¶ 12.

A. The ‘546 Patent

The parties do not dispute that the generic triple melt process comprised of the VIM, ESR, and VAR steps has been in use for many years. See Carpenter SMF at ¶ 15; ATI SMF at ¶ 15. The United States Patent and Trademark Office (“PTO”) issued the ‘564 patent on July 9, 2002. U.S. Patent No. 6,416,564 (filed Mar. 8, 2001). It issued the ‘858 patent, entitled “Large Diameter Ingots of Nickel Base Alloys” on April 13, 2004. U.S. Patent No. 6,719,858 (filed Feb. 4, 2002). The ‘858 patent is a division of the ‘564 patent. Id. col. 2 l. 4-5. ATI is the assignee of the ‘858 patent.

The ‘564 patent’s invention background explains that nickel base superalloys including both Alloy 706 and Alloy 718 “are subject to significant[] positive and negative segregation.” ‘564 Patent col. 2 l. 7-8. Positive segregation is “an enriched concentration of an alloying element at a specific region” and negative segregation is “a decreased concentration of an alloying element at a specific region.” Joint Claim Construction at 2. According to the patent, “freckles” are the most common manifestations of positive segregation and “white spots” result from negative segregation. ‘564 Patent col. 1 l. 44-53. Freckles and white spots represent weaknesses in ingots that can potentially lead to cracking. See id. at col. 1 l. 52-59. A cracked ingot is unsuitable for use. “Ingots substantially lacking positive and negative segregation and that are also free of freckles are referred to [within the patent] as ‘premium quality’ ingots.” Id. at col. 1 l. 60-63. As described in the patent, “an ingot ‘substantially lacks’ positive and negative segregation when such types of segregation are wholly absent or are present only to an extent

that does not make the ingot unsuitable for use in critical applications, such as use for fabrication into rotating components for aeronautical and land-based turbine applications.” Id. at col. 2 l. 1-6. The background section goes on to explain that Alloys 706 and 718 are particularly segregation-prone during casting, especially when large diameter ingots are produced. See id. at col. 2 l. 7-9. It explains that the triple melt process existing at the time of patent application was unsuitable for the creation of Alloy 718 ingots in sizes necessary for “emerging applications.” See id. at col. 2 l. 27-64. The procedures in place at the time of patenting allowed for creation of ingots up to twenty inches in diameter, with only limited production of ingots up to 28 inches. See id. at l. 53-56. Ingots in those smaller diameters “fall far short of the weights needed in emerging applications requiring premium quality nickel base superalloy material.” Id. at col. 2 l. 55-64. “In order to address the above-described needs, the present invention provides a novel method of producing a nickel base superalloy” that “may be used to cast VAR ingots of premium quality from Alloy 718 in diameters greater than 30 inches[.]” Id. at col 2 l. 65-67, col.3 l. 1-9.

The summary of the invention describes numerous steps: first, “a nickel base superalloy” is cast in a mold using vacuum induction melting (VIM); second, the “[t]he cast ingot is . . . annealed² and overaged³ by, heating the alloy at a furnace temperature of at least 1200 [degrees Fahrenheit] for at least 10 hours;” third, the ingot is transferred “to a heating surface within 4 hours of complete solidification” and subjected to a “post-electroslag remelting” (“ESR”) heat treatment; and finally, it is vacuum arc remelted (“VAR”) to produce a VAR ingot. Claim 1 of

² Annealing is “a process to treat metal by heating and cooling in such a way to remove internal stresses and make the material less brittle and to produce desired changes in other properties or microstructure.” Parties’ Joint Claim Construction, 2.

³ Overaging is “aging under conditions of time and/or temperature greater than those required to obtain maximum change in a certain property.” Parties’ Joint Claim Construction, 3.

the patent is:

A method of producing a nickel base superalloy that is substantially free of positive and negative segregation, the method comprising:

casting an alloy that is a nickel base superalloy within a casting mold;

annealing and overaging the alloy by heating the alloy at at least 1200° F. (649° C.) for at least 10 hours;

electroslag remelting the alloy at a melt rate of at least 8 lbs/min. (3.63 kg/min.);

transferring the alloy to a heating furnace within 4 hours of complete solidification;

holding the alloy within the heating furnace at a first temperature of 1600° F (316° C.) to 1800°F (982° C.) for at least 10 hours;

increasing the furnace temperature from the first temperature to a second temperature of at least 2125° F. (1163°C.) in a manner to inhibit thermal stresses within the alloy;

holding at the second temperature for at least ten hours;

vacuum arc remelting a VAR electrode of the alloy at a melt rate of 8 to 11 lbs./minute (3.63 to 5 kg/minute) to provide a VAR ingot.

‘564 patent, col. 13 l. 60-67 – col. 14 l. 34-48. Claims 2 through 7 are dependent on claim 1, and describe ingots of greater than 30 or 36 inches in diameter, and proscribe weights and alloy compositions. The remaining claims of the patent, for the most part, contain specific time and temperature requirements to be employed at specific times during the triple melt process, including heating, transferring, holding, cooling, annealing, and overaging.

B. Expert Report of Alec Mitchell

Carpenter relies heavily on the report of its expert, Alec Mitchell, in making its case for obviousness. Dr. Mitchell contends that Alloys 706 and 718 have been “standard metals for HPT (high pressure turbine) disks for many years” and notes that their “development is linked.” Expert Report of Alec Mitchell, 5 (Carpenter Ex. L). Specifically, he states that:

Over the past twenty years the designers of gas turbines for power generation have demanded larger disk forgings as the size of the turbo-machinery has become larger. In consequence a demand developed from [GE], first for large 706 forgings and subsequently for large 718 forgings to be used as [high pressure turbine] disks in land-based industrial gas turbines.

Id. He explains that both alloys “have specifications in which the composition is given as ranges of elements [such as carbon and niobium] rather than as precise values.” Id. Alloy 718 is used in “highly exacting applications in aerospace for example” and has the “highest niobium content possible[.]” Id. at 6. He states:

Due to the segregation characteristics of the high-niobium (5.3 – 5.4 [weight] %) [718] alloy and to other issues in the final VAR processing step, this composition limits the maximum size of ingot it is possible to manufacture (to the quality standards applicable to rotating part use in aerospace applications) through the triple melt process to 600 mm [23.62 inches].

Id.

Dr. Mitchell argues that the compositions of both Alloy 706 and Alloy 718 can be manipulated in this way, and that when it was recognized that Alloy 706 was not adequate for use in the larger gas turbines manufactured by GE, “the logical extension of the technology was in the direction of lowering the niobium content of alloy 718 to make the manufacture of large forgings practical in this alloy.” Id. at 7. He further opines that “the resulting change in niobium content in 718 was in the direction of making the alloy more closely resemble alloy 706.” Id. at 7. He argues that this was a logical step in the technology in part because forgings of 706 ingots acceptable for use with land-based turbines had reached 1000 mm, as opposed to the 600 mm limitation of high niobium content Alloy 718 ingots. See id.

This comparison of Alloy 706 and Alloy 718 is key to Dr. Mitchell’s opinion that the ‘568 patent was obvious because “[a] person skilled in the art would have had sufficient

knowledge to manufacture the subject ingots based on his melting experience, published reports of relevant process procedures, software and available computational techniques.” Mitchell Report, 8. With respect to Claim 1, he argues again that Alloys 706 and 718, both niobium-containing alloys, have similar mechanical properties, react similarly to thermal stresses, and have a similar need for “relief of the residual stresses produced by the non-uniform temperature existing during the heating or cooling of large ingots.” Id. at 8. These similarities, he claims, have been understood for many years. Id. He opines that “[t]he melting rates given in [Claim 1 of the ‘564 Patent] for alloy 718 are those which are used for alloy 706 in the same process sequence and ingot sizes as those in the Claim and would have been readily predictable for the case of a similar-sized ingot of 718 due to the close similarity of the two alloys in respect of solidification behavior.” Id. at 9. In other words, Dr. Mitchell believes that the established relevant prior art with respect to Alloy 706 ingots made the patented triple-melt process using Alloy 718 predictable and obvious.

In support of his conclusion that Alloys 706 and 718 were so similar that it was obvious that the triple melt process used on the 706 could be extended to the 718, he cites the following articles: “Fesland et al, Proc Conf Superalloys 718, publ TMS 1997,” “Gross, Proc Conf. Superalloys 718, publ TMS 1994,” and “Helms et al: Superalloys 1996.” Mitchell Report, “Documents considered or relied upon (Amended 3/25/2010).” He claims that Fesland reported triple melting for large diameter 706 ingots prior to 2001 and the extension of the process to 718 ingots “in accordance with the market demand existing at the time.” Id. at 8. He claims that the Helms article established “the merits of the triple melting process in reducing the defect level of the final product . . . prior to 2001” and that it also “comments on the similarity of the forging

grade superalloys 718 and 706 in respect of manufacturing processes.” Id.

To support his obviousness conclusion, Dr. Mitchell also observes that, because the physical properties of Alloy 706 and Alloy 718 are already known, as is the basic requirement that time-controlled heating and cooling cycles and time-controlled removal of the ingot from a casting mold are necessary to produce a segregation-free ingot, “the computational methods available in 1970 and subsequently . . . enable a computation of the required thermal cycles for minimizing residual stresses in both the as-cast electrodes and the ‘annealing’ cycles applied to the electrodes before melting.” Id. at 8. He acknowledges that detailed procedures for stress-relief will depend on the mechanical properties of the particular alloy, but notes that readily available “time-temperature-transformation (“TTT”) diagrams” enable manufacturers “to decide the required temperature and time to achieve the precipitate decomposition necessary.” Id. He concludes that “[i]n combination with the computed stress field and knowledge of the alloy mechanical properties relative to structure, the ‘annealing’ cycle can then be defined.” Id.

Dr. Mitchell makes similar conclusions about Alloys 706 and 718 with respect to the other claims in the patent. For example, he asserts that Claim 2 is obvious since “the subsequent melting process for the 718 was based on published experience with 706 and hence very closely related to it using the same parameters developed for the same reasons.” Mitchell Report, 10. With respect to the slow heating and cooling rates as described in Claims 12-16 of the patent, Dr. Mitchell opines that:

The requirement of a slow heating or cooling rate at low temperature is obvious since all large ingots of superalloys are known to be sensitive to cracking due to thermal shock. The industry already practices slow heating/cooling in this temperature range for large ingots of 706 and for ingots of 718 up to 720 mm diameter prior to 2001 and it would have been an obvious extension of the practice to use the same method for a

larger ingot of 718.
Id. at 13.

Among Dr. Mitchell's final conclusions and opinions are that “[t]he information contained in the claims of the Patent was available in the public domain before the time of the Patent application,” “[t]he techniques detailed in the Patent are an obvious extension of the known technology at the time of the Patent application,” and finally, that “[b]ased on the knowledge publicly available prior to 2001, the modification of production parameters required to make large diameter ingots of 718 would have been obvious to a person skilled in the art.” Id. at 16. In other words, the basic conclusions of Dr. Mitchell's report depend on the assumption that Alloy 706 and Alloy 718 are very similar. Relying on this assumption, he opines that it would be obvious to use known techniques for casting a large diameter, high quality Alloy 706 ingot to cast a large diameter, high quality Alloy 718 ingot.

C. Expert Report of James Williams

ATI also relies on the report of an expert in metallurgical engineering, Dr. James Williams. Dr. Williams provides much of the same background information on superalloys contained in Dr. Mitchell's report, explaining that they are key parts of “turbo machinery” and are used in gas turbines and aircraft and ship propulsion. Expert Report of James C. Williams, 2 (ATI Ex. 5). His report, which was written in August of 2010, explains that the need for large diameter ingots of the kind described in the '568 patent did not arise until approximately 20 years before, when “the power generation industry was aggressively trying to design new, more efficient turbines having higher operating temperatures to improve fuel efficiency and reduce emissions[.]” Id. at 3. Dr. Williams explores the problems posed by segregation of niobium-rich

Alloy 718 ingots during casting and solidification, and states that “[t]he elimination of such segregation becomes the limiting factor in determining how large in diameter an ingot of a [niobium] rich alloy such as Alloy 718 can be successfully cast.” Id. at 4. He explains that an alternative to managing the segregation of niobium in Alloy 718 ingots was to develop an alloy containing a lower percentage of niobium; the alloy developed was Alloy 706. Id. Dr. Williams describes industry use of Alloy 706 ingots as a “compromise . . . to meet the new product introduction schedule caused by the rapidly increasing consumption of electricity and increases in fuel cost.” Id.

The bulk of Dr. Williams’ report is directed at addressing many of the conclusions reached by Dr. Mitchell. Dr. Williams properly identifies as the most “pervasive” assertion in Dr. Mitchell’s report that Alloy 706 and Alloy 718 are extremely similar. Williams Report, 5. He attacks this conclusion, asserting that it is “contrary to extensive literature, industry practices, and the views of those skilled in the art[.]” Id. He points out that the two alloys are dissimilar enough to have required separate patents, and delineates the way in which Alloy 706 was used in land-based turbines earlier due to its different composition:

[T]he first superalloy used in the new turbines was the less capable Alloy 706 [], not Alloy 718. This is clearly because the capability to make large ingots of Alloy 706 but not of Alloy 718 had been demonstrated at the time the first turbines to use superalloy disks were placed into production. If, in fact, these two alloys were ‘closely similar,’ there would have been no need to create let alone use the more dilute compromise composition represented by Alloy 706.

Id.

Dr. Williams also attacks Dr. Mitchell’s assertions about the availability of computational modeling to predict the melt rates described in the patent. See id. He points out that ATI did not rely on the modeling capability described by Dr. Mitchell, and more broadly asserts that while

the long-term “goal of the collective materials community is to use modeling and simulation to reduce or eliminate experimentation during the development of a new process or product (alloy) . . . this goal has not been realized” as of 2010. Id. He gives numerous examples of data that require high quality quantitative experimentation to input into the models and asserts that “the *ab initio* methods for calculating these data are not yet mature.” Id. at 6. He claims that this kind of necessary experimental data for Alloys 706 and 718 simply does not yet exist. He concludes, directly contradicting Dr. Mitchell, that “the models cannot predict the resulting solidification behavior at these ingot sizes with necessary certainty.” Id.

Dr. Williams also criticizes Dr. Mitchell’s reliance on TTT diagrams, on the ground that these diagrams are not pertinent to segregated ingots such as those described in the patents and on the ground that these diagrams are not relevant to continuous cooling situations such as those described in the patent. See id. Dr. Williams discredits Dr. Mitchell’s assertion that the stress relief parameters described in the patent were well understood in the industry and calculable using available computational methods prior to the issuance of the patent. See id. at 6-7. Specifically, he faults Dr. Mitchell for relying on published prior art concerning melt rates during the ESR and VAR process because the articles Dr. Mitchell cites do not “disclose computational modeling of melting rates for nickel superalloy ingots having a diameter greater than 30 inches,” instead describing melt rates used with other alloys or at significantly smaller diameters. See id. at 11.

Dr. Williams also addresses many of the prior art references relied on by Dr. Mitchell to support his assertion that the triple melt process described in the ‘568 patent was obvious. First, he disagrees with Dr. Mitchell about the significance of the 1997 Fesland article. Dr. Mitchell

claims that this prior art reference extended the triple melt process to Alloy 718 ingots; Dr. Williams states that Fesland reported a 718 ingot of 28 inches in diameter (two inches smaller than the smallest ingot described in the patent), commented that meeting the demand for ingots larger than 24 inches presented a challenge, and provided no specific guidance whatsoever on melt rates for the 28-inch ingot reported or for larger ones. Williams Report, 8. Specifically, he states that while “Fesland 1997 suggest that it appears to be possible to develop a melting process to produce 710 mm (28 inches) diameter Alloy 718 ingots,” he “provides no specific guidance other than saying that the VAR melt rate window is narrow.” Id. at 8. Fesland “does not disclose any melting parameters, and therefore would not have rendered the melting parameters in the claims of the 564 patent obvious.” Id. Dr. Williams opines that “it would not have been obvious from Fesland 1997 that one would be able to cast ingots of Alloy 718 having diameters greater than 30 inches.” Id.

He also addresses whether a combination of the Fesland article and the 1994 Grose article (which was also cited by Dr. Mitchell) would have made the claims in the ‘564 patent obvious. See id. at 8. He states that while Grose discloses using triple melt for casting 706 ingots of up to 36 inches, Grose does not reveal any specific melting parameters. Id. Finally, Dr. Williams discusses the 1996 Helms article, asserting that it discloses the use of Alloy 706 in making ingots of up to 40 inches in diameter but does not disclose the making of similarly-sized 718 ingots, instead only stating that a program was underway to cast 718 ingots of 27 inches in diameter. See id.

Dr. Williams addresses most of the other prior art references relied upon by Dr. Mitchell, acknowledging that many of them compare Alloys 706 and 718, contain information about the

microstructure of the two alloys, and otherwise disclose that they are similar in some respects.

However, he opines that:

While the above-cited references suggest that [triple melt] is a process that can be used to produce quality nickel superalloy ingots, they do not disclose specific melting parameters for producing quality ingots, and therefore, the melting parameters recited in the claims of the 564 and 858 patents would not have been obvious to a person having ordinary skill in the art. In addition, these references at least imply that it is problematic to use [triple melt] to cast quality ingots of Alloy 718 having a diameter of 27 inches, so it would not have been obvious that [triple melt] could be used to cast substantially segregation free ingots of Alloy 718 having diameters of greater than 30 inches.

Williams Report at 9.

In sum, Dr. Williams concludes that, in part because of the challenges posed by the different composition of Alloy 718, the relevant prior art on using the triple melt process to cast large diameter 706 Alloy ingots would not have rendered the ‘546 patent obvious.

II. STANDARD OF REVIEW

Summary judgment may be granted where when no “reasonable jury could return a verdict for the nonmoving party.” Anderson v. Liberty Lobby, Inc., 477 U.S. 242, 248, 106 S.Ct. 2505 (1986). It is proper if the movant shows “that there is no genuine dispute as to any material fact and the movant is entitled to judgment as a matter of law.” FED. R. CIV. P. 56(a). A party moving for summary judgment must support its position that material facts are not in dispute by “citing to particular parts of materials in the record, including depositions, documents, electronically stored information, affidavits or declarations, stipulations (including those made for purposes of the motion only), admissions, interrogatory answers, or other materials; or . . . showing that the materials cited do not establish the absence or presence of a genuine dispute, or

that an adverse party cannot produce admissible evidence to support the fact.” FED. R. CIV. P. 56(c).

Patents, once obtained, enjoy a presumption of validity. See 35 U.S.C. § 282. Therefore, “a moving party seeking to invalidate a patent at summary judgment must submit such clear and convincing evidence of facts underlying invalidity that no reasonable jury could find otherwise.” TriMed, Inc. v. Stryker Corp., 608 F.3d 1333, 1340 (Fed. Cir. 2010) (citing SRAM Corp. v. AD-II Eng'g, Inc., 465 F.3d 1351, 1357 (Fed. Cir. 2006)).

III. DISCUSSION

Under Section 103(a) of the Patent Code, “[a] patent may not be obtained . . . if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.” 35 U.S.C. § 103(a). Obviousness is a question of law based on underlying findings of fact. See TriMed, 608 F.3d at 1341. Under Graham v. John Deere Co. of Kansas City, 383 U.S. 1, 86 S.Ct. 684 (1966), the analysis of whether a patent is obvious is objective. The so-called Graham factors – factual determinations for obviousness – are the following:

- (1) the scope and content of the prior art; (2) the differences between the prior art and the claimed invention and the prior art; (3) the level of ordinary skill in the pertinent art; and (4) any relevant secondary considerations, including commercial success, long felt but unsolved needs, failure of others, etc.

Graham, 383 U.S. at 17-18. Summary judgment of obviousness is appropriate if “the content of the prior art, the scope of the patent claim, and the level of ordinary skill in the art are not in

material dispute, and the obviousness of the claim is apparent in light of these factors.” TriMed, 608 F.3d at 1341 (citing KSR Int’l Co. v. Teleflex Inc., 550 U.S. 398, 427, 127 S.Ct. 1727 (2007)). “What a particular reference discloses is a question of fact, as is the question of whether there was a reason to combine certain references.” Transocean Offshore Deepwater Drilling, Inc. v. Maersk Contractors USA, Inc., 617 F.3d 1296, 1303 (Fed. Cir. 2010) (citing Para-Ordnance Mfg., Inc. v. SGS Imp. Int’l, Inc., 73 F.3d 1085, 1088 (Fed.Cir.1995) and McGinley v. Franklin Sports, Inc., 262 F.3d 1339, 1352 (Fed.Cir.2001)).

In the years following Graham, the Federal Circuit employed what is known as the teaching, suggestion, or motivation “TSM” test, under which a patent claim is only proved obvious if “some motivation or suggestion to combine the prior art teachings” can be found in the prior art, the nature of the problem, or the knowledge of a person having ordinary skill in the art. See e.g., Al-Site Corp. v. VSI Int’l., Inc., 174 F.3d 1308, 1323-24 (Fed. Cir. 1999).

More recently, the Supreme Court has observed that, although Graham underscores the need for “uniformity and definiteness” in undertaking an obviousness analysis, relevant precedent should be read to allow for more than a rigid application of its factors. Instead, the analysis should be “expansive,” “flexible,” and “functional” and should allow reviewing courts “to look at any secondary considerations that would prove instructive.” KSR, 550 U.S. at 415. Such considerations include “design incentives and other market forces” that prompt variations of prior art. Id. at 417. “If a person of ordinary skill can implement a predictable variation, § 103 likely bars its patentability.” Id. Looking to relevant articles in the field and the explicit content of issued patents will not necessarily assist reviewing courts in determining obviousness, since “[i]n many fields it may be that there is little discussion of obvious techniques or

combinations, and it often may be the case that market demand, rather than scientific literature, will drive design trends.” Id. at 419.

The Supreme Court and the Federal Circuit have stressed that expert testimony has an important role to play in considering summary judgment on obviousness, and have observed that conflict in testimony between experts on one of the Graham factors is likely to preclude summary judgment. See KSR, 550 U.S. at 427, (stating that “[i]n considering summary judgment on [the] question [of obviousness] the district court can and should take into account expert testimony, which may resolve or keep open certain questions of fact,” but noting that, in the case before it, the content of prior art, scope of the patent claim, and level of ordinary skill in the art are “not in material dispute.”); B-K Lighting, Inc. v. Fresno Valves & Castings, Inc., 375 Fed. Appx. 28, 32 (Fed. Cir. 2010) (vacating the District Court’s judgment of invalidity “[b]ecause the conflicting testimony of the parties’ experts regarding whether [a prior art reference] disclosed a frictional pivoting created a genuine issue of material fact[.]”); Metro. Life Ins. Co. v. Bancorp Serv., L.L.C., 527 F.3d 1330, 1338-39 (Fed. Cir. 2008) (overturning District Court’s grant of summary judgment where it improperly resolved “a direct conflict in the declarations [of the parties’ experts] as to a material fact under [the patentee’s] interpretation of the claims.”).

Carpenter argues that the ‘564 patent was obvious. It points to evidence including: (1) “the history of ATI’s development process itself,” as explained through the testimony of ATI’s Vice-President, Dick Kennedy, who stated that that ATI’s development of a 27 inch, then 30 inch, then greater than 36 inch ingot, was “a natural progression;” (2) testimony of two GE employees, Robin Schwant and Sam Thamboo, who, when questioned about their familiarity

with the ingots of increasing size, stated that the techniques used to make ingots 30 inches and greater were standard or obvious in light of the techniques used to make smaller ingots of the same alloys; (3) GE documentation showing that its process specifications for the forging of Alloy 718 ingots were similar to the processes set forth in the patent; (4) the expert report of Dr. Mitchell, and (5) the expert report of Dr. Sunil Widge. See Carpenter Mem. in Support of Motion for Summ. J. Based on 35 U.S.C. § 103(a) (“Carpenter Mem.”), 32-34.

ATI claims that there are numerous and substantial disputes of material fact precluding summary judgment, the first of which concerns the scope and content of prior art. In order for this Court to grant Carpenter’s motion, there must be no genuine dispute of material fact concerning the scope and content of the prior art.

Carpenter points to a number of prior art documents in its motion. Among them are Carpenter technical reports and GE manufacturing process plans. With respect to Carpenter’s internal plans, ATI argues correctly that material is not prior art for purpose of the obviousness inquiry if it was not publicly available prior to the invention, and it was not disclosed to the inventor. See Oddzon Prods., Inc. v. Just Toys, Inc., 122 F.3d 1396, 1401-04 (Fed. Cir. 1997). Carpenter, through the testimony of Carpenter metallurgist Sunil Widge, essentially argues that because it had “specified a combination of processing steps that meet the steps recited in Claim 1, and other claims, of the ‘564 patent,” the patent was obvious. See Carpenter Mem. at 27. Dr. Widge, who was Carpenter’s Vice-President of Technology and Quality during the relevant time, testified that Carpenter’s review of the patents following their issuance caused some concern, because individuals from Carpenter thought that certain aspects of the patent had been disclosed “well before” the patent application and that it was obvious that the same developmental process

of Alloy 706 ingots from 30 to 36 inches could be applied to 718 ingots. See Widge Dep. 30:7-9; 35:12-36:9, Sep. 3, 2009 (Carpenter Ex. O). Carpenter's internal technical reports are not prior art for purposes of the obviousness inquiry, because they were confidential Carpenter documents.⁴ Dr. Widge's testimony concerning the obviousness of applying casting techniques for Alloy 706 ingots is not prior art.

Carpenter also cites GE process specifications for forgings of Alloy 718. Review of the 1995 specification reveals that it largely addresses the composition of the Alloy 718 to be used by the ingot manufacturer, and does not require by name the use of the triple melt process, or describe the triple melt process contained in the patent. See GE Material Specification B50A915 (ATI Ex. 35). The 1993 specification, on the other hand, does require that the material processed according to the specification be "melt[ed] by VIM followed by ESR and then VAR," but does not contain any time, temperature, or melt rate parameters; rather providing that the parameters used shall be recorded and the records maintained. See GE Material Specification P14A-AG1 (ATI Ex. 36). These specifications therefore do not establish obviousness, since they contain only general descriptions of the triple melt process, and do not contain specific time, temperature, heating, and cooling parameters as do the claims of the patent.

For the most part, Carpenter relies on the conclusions of Dr. Mitchell in arguing that prior art references render the '564 Patent obvious. As discussed above, Dr. Mitchell relied on two basic premises for his position: that Alloys 706 and 718 are so similar that it is obvious to use the triple melt process on one the same way it is used on the other; and that computational methods available at the time of patenting allowed for the prediction of appropriate rates of melting and

⁴ Dr. Widge testified that Carpenter did not provide GE with copies of its procedures for casting 718 ingots, out of concern for "technology leakage" and to ensure that no one else got their hands on Carpenter's reports. See Widge Dep., 198: 16-22.

cooling. Dr. Williams discusses the prior art references contained in Dr. Mitchell's report and asserts that they would not render the process claimed in the '564 patent obvious. He opines, directly contradicting Dr. Mitchell, that it would not have been obvious, based on the scope of prior art, to employ the patented process to make large diameter, segregation-free Alloy 718 ingots. This was because the prior art did not disclose specific melting parameters and was largely directed towards the melting of ingots made from Alloy 706, which is not so substantially similar to Alloy 718 that using the same triple melt process would be obvious.

Dr. Mitchell and Dr. Williams are clearly in dispute over whether the prior art discloses a method for triple melting large-diameter 718 Alloy ingots. Dr. Williams directly addresses the prior art references contained in Dr. Mitchell's report, and states that these references are largely directed at 706 alloy ingots and only generally describe the triple melt process for 718 ingots. He also disputes whether it would have been obvious to a person of ordinary skill in the art to attempt to make large diameter Alloy 718 ingots established triple melt parameters. Neither Dr. Mitchell nor Carpenter offers an explanation for the clear dispute between Drs. Mitchell and Williams.

ATI offers numerous references showing that, because of the differences between Alloys 706 and 718, it would not have been obvious to simply use the triple melt process developed for 706 ingots on 718 ingots. Specifically, ATI provided the testimony of Dr. Ashish Patel, a Carpenter metallurgist, who explained that one could not simply take the process developed for triple melting 706 ingots and apply it to 718 ingots. See Patel Dep., 40:3-20, Aug. 28, 2009 (ATI Ex. 8). He explained that due to differences in composition between the two alloys, triple melting the 718 to make large diameter ingots would require different heat-treatment cycles

(including different times and temperatures), and keeping the VAR parameters in a tighter window, among other things. See id. at 39-42.

ATI also provides evidence that prior art teaches *away* from the claimed invention, offering articles published by Dr. Mitchell in the years prior to the issuance of the '564 patent. In an article published in 1991, he opined that due to the segregation that takes place during casting of Alloy 718 ingots, "the effective limit of the production of ingots by VAR is set at a diameter of approximately 500 mm [19.68 inches] in the case [of] aeroengine quality, and probably not of beyond 600 mm [23.62 inches] for any mechanical purpose which involves using the whole ingot cross-section." A. Mitchell, "Melting Processes and Solidification in Alloys 718-625," SUPERALLOYS 718, 625 AND VARIOUS DERIVATIVES, 19 (1991) (ATI Ex. 10). He stated in the same article that the "present maximum sizes made by VAR represent not only the practical but also the theoretical limits of the process." Id. at 23. In 1995, he stated that, even given the possibility of accepting some segregation in a 718 ingot, "it is highly likely, given the many years in the melting development of this alloy, that the 650 mm diameter is the maximum possible size by [using the triple-melt process]." A. Mitchell, "Actual and Potential Manufacturing Problems in the Production of Superalloy Components for Industrial Gas Turbines," 3d Int'l Charles Parsons Turbine Conference, 551 (ATI Ex. 12).

ATI has demonstrated that there are genuine disputes between the parties on the scope and content of the prior art and on whether it would have been obvious to a person of ordinary skill to attempt using established triple melt procedures to make large-diameter 718 ingots. Carpenter's expert, Dr. Mitchell, opines that the similarities between the 706 and 718 Alloys would have made it obvious to a person skilled in the art to use the claimed process. ATI

provides relevant prior art teaching away from the claimed invention, and presents expert testimony that conflicts with Dr. Mitchell's. Dr. Williams, dissects the prior art references relied upon by Dr. Mitchell and opines that the differences between Alloys 706 and 718 would not have made the claimed invention obvious. He explains that the prior art references do not set forth the process claimed in the invention because they do not contain specific melt rate parameters for use with 718 Alloy and largely do not apply to 718 Alloy ingots. He also disputes that computerized modeling was sufficient to predict proper heating and cooling rates for use in casting a segregation-free, large diameter 718 ingot. In other words, Dr. Mitchell and Dr. Williams disagree about whether known triple melt processes for casting large-diameter Alloy 706 ingots rendered the patented process, which describes specific triple melt parameters for casting large-diameter 718 ingots, obvious. Their opinions also reflect a genuine dispute over whether a person of ordinary skill in the art would have been able to use known procedures for the triple melting of 706 Alloy ingots to produce a segregation free, large-diameter 718 Alloy ingot.

IV. CONCLUSION

To grant summary judgment in Carpenter's favor on the issue of obviousness, there must be no material dispute concerning the scope and content of prior art, the level of knowledge of one of ordinary skill in the art, and the difference between prior art and claimed invention. There is a genuine dispute on the scope and content of prior art and whether a person of ordinary skill in the art would have been able to predict the claims in the patent. Carpenter's motion for summary judgment on the issue of obviousness will be denied. An appropriate order follows.